R E P O R T R E S U M E S

ED 003 574 56

A COMPARATIVE STUDY ON THE EFFECTIVENESS OF THE FILMSTRIP, SOUND FILMSTRIP, AND FILMOGRAPH FOR TEACHING FACTS AND CONCEPTS.

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REPORT NUMBER NDEA-VIIA-462 PUB DATE 15 FEB 61
GRANT OEG-7-04-102-00
EDRS PRICE MF-$0.09 HC-$1.20 30P.

DESCRIPTORS- *FILMS, *INSTRUCTIONAL FILMS, SOUND FILMS, *AUDIOVISUAL AIDS, *FILMSTRIPS, GRADE 6, *LEARNING PROCESSES, RETENTION, LOS ANGELES, CALIFORNIA

THIS STUDY COMPARED THE RELATIVE EFFECTIVENESS IN FACTUAL LEARNING OF (1) A CAPTIONED FILMSTRIP, (2) A CAPTIONED FILMSTRIP WITH NARRATION, (3) A SOUND FILMSTRIP, AND (4) A FILMOGRAPH. (THE FILMOGRAPH WAS MADE BY PHOTOGRAPHING STILL PICTURES ON MOTION PICTURE FILM.) THE STUDY TESTED THE HYPOTHESIS THAT THE FILMOGRAPHY COULD TEACH MORE EFFECTIVELY. FOUR MATCHED GROUPS OF ABOUT THE SAME SIZE WERE FORMED FROM A POPULATION OF 558 SIXTH-GRADE STUDENTS. AFTER THE MATERIALS HAD BEEN PRODUCED AND TESTS MADE, A PILOT STUDY WAS CONDUCTED SO THAT ANY NECESSARY REFINEMENTS ON THE TESTS AND PROCEDURES COULD BE MADE. THE EXPERIMENT WAS ADMINISTERED SO THAT THE STUDENTS IN EACH CLASS HAD A PRETEST, SAW THE PRESENTATION, AND THEN HAD A POST-TEST, ALL WITHIN AN HOUR. A RETENTION-TEST WAS ADMINISTERED AFTER A 3-WEEK PERIOD. IT WAS FOUND THAT NO ONE METHOD WAS SIGNIFICANTLY SUPERIOR. OTHER FINDINGS WERE--(1) BOYS DID SIGNIFICANTLY BETTER THAN GIRLS ON THE MEAN GAIN BETWEEN PRETEST AND POST-TEST AS WELL AS ON THE RETENTION-TEST, AND (2) STUDENTS WITH HIGHER INTELLIGENCE DID SIGNIFICANTLY BETTER THAN THOSE WITH LOWER INTELLIGENCE. (JC)

ED003574

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462 462

Final Report

Grant No: 7-04-102.00

U.S. OFFICE OF EDUCATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

A Comparative Study on the Effectiveness of the Filmstrip, Sound Filmstrip, and Filmograph for Teaching Facts and Concepts

RONALD J. McBEATH
Principal Investigator

The research reported herein was supported by a grant from the United States Office of Education, Department of Health, Education, and Welfare.

February 15, 1961

Submitted by
Department of Audio-Visual Education
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CHAPTER I

INTRODUCTION

Advances in knowledge in all fields, and especially in science, have increased the instructional task of the classroom teacher. The teacher must have not only a deeper and wider understanding of his subject matter but also the best instructional techniques for its presentation.

Over the past forty years an ever-growing amount of research has been published regarding the effectiveness of various audio-visual media in presenting knowledge. In the area of filmed material many studies have been conducted but none were available comparing the filmograph with filmstrips. The writer felt that a comparative study in this area would show whether the filmograph could be a more effective teaching tool than either the captioned or the sound filmstrip. The filmograph is made by photographing still pictures on motion picture film, using such techniques as camera movement and pop-ons.

An experiment comparing the effectiveness of the filmograph and filmstrips was considered a logical extension to research conducted by Zuckerman (51) and by May and Lumsdaine (16).

Zuckerman, in 1954, reported an attempt to find an economical way to conduct pre-release testing for educational films. From the story board of a film, 262 frames were selected to make a filmstrip. The film was used to familiarize jet pilots with speed limitations and load limits of the F86A. The sound track of the film was recorded on a disc. One hundred and eighty airmen of comparable background experience were randomly assigned to receive instruction by the film and by the filmstrip with the recording. The presentation took place in comparable classrooms and for the same amount of time. A twenty-six-item multiple-choice test was given to check gains in knowledge.

There was no statistically significant difference between the effectiveness of the media, hence Zuckerman concluded that the filmstrip could be used to reliably predict the effectiveness of the film.

The study reported by May and Lumsdaine (16:18), in 1958, compared a film with a film of the story board. The pencil sketches selected from the story board were photographed on 16mm motion picture film. The narration of the film was put on a sound track to accompany the filmed pencil sketches. This type of production is very similar to a filmograph.

Four classes of fifth grade pupils were subjects in the experiment. They were randomly divided into halves, and while one half saw the film, the other half continued with regular school work. After seeing the film, the first group of students took a ninety-one-item test, while the other half saw the pencil-sketch version. Both groups were allowed as much time as they needed, about twenty minutes, to finish the test.

A random selection of fifty pupils in each group was made for convenience of analysis. No pre-test was given, but it was assumed that, due to randomizing, the groups were insured for substantial initial equality. A comparison of the mean scores showed that there was no significant difference in learning between the crude pencil-test and the polished final film.

In their evaluation of the study, May and Lumsdaine noted that, besides the major variable involved, there were others which might have influenced the results. They concluded that, for teaching the kind of material important in understanding seasonal changes, a crude presentation such as the pencil-test film can teach at least as well as a polished color-film costing ten times as much.

It was partly the results and suggestions of these two studies which led to the present investigation and formulation of the statement of the objectives of this research.

The Problem

It was the purpose of this study to compare the relative effectiveness of four filmic methods of presenting facts and concepts. The four filmic methods were:

1. Captioned filmstrip.
2. Captioned filmstrip with narration.
3. Sound filmstrip.
4. Filmograph.

The study attempted to answer the following questions with equivalent groups of students who were required to perform on a post-test given immediately after the presentation and on a retention-test given three weeks later:

1. Is one method superior or inferior to the other methods?
2. Do boys learn better from the media than girls?
3. Do students with a higher intelligence quotient learn better than those with a lower intelligence quotient?

The study attempted to verify the hypothesis that the filmograph could teach more effectively than the other media.

CHAPTER II

METHOD OF PROCEDURE

A design for the experiment was formed and put into operation so that maximum control could be maintained. The following outlines the order of procedure:

1. Production of filmstrips and filmograph.
2. Preparation of testing instruments.
3. Selection of experimental population.
4. Pilot study to refine testing instruments and procedures.
5. Administration of the experiment.
6. Assembling of the data.
7. Statistical analysis of the data.

The steps outlined above will now be discussed more fully.

Production of Filmstrips and Filmograph

The content was directed towards sixth grade social studies. A script was developed around the exodus of the Maoris from Polynesia, their sea voyage to New Zealand, and their way of life in New Zealand before and after the arrival of the white settlers. It was decided to limit the filmograph to a 400' reel and the filmstrips to seventy-two frames as this is the usual length of materials at the sixth grade level. A breakdown of the script into the major parts was made and the essential facts were selected. The exacting process of expressing the essential facts in an interesting caption and picture was begun. An arbitrary limit of four new facts was set for each caption and a determined attempt was made to work well within this limitation. A significant guide to the content of each caption was obtained while developing seventy multiple-choice questions.

The sketches were drawn so that they would contribute to the students' knowledge by presenting relevant cues and not inhibit learning through distracting cues. Care was taken so that the pictorial element was not deficient in detail, definition, or clarity. Refinements and revisions were made of both verbal and pictorial statements following advice given to the producer by experts at the University of Southern California and audio-visual directors in Los Angeles City and County.

The finished art work was done with a black felt-tipped pen, shadows and perspective being achieved through water-color washes and dry-brush technique. Retouching of the art work for photographing was done by a professional artist.

The filmstrip with and the filmstrip without captions were photographed in the usual double frame technique on 35mm film. The captions were limited to three lines of black print on white background at the bottom of each frame on the captioned filmstrip. No captions were included on the sound filmstrip. Filming of the filmograph was completed on an animation stand in the Cinema Department of the University of Southern California. The sound track of the filmograph was duplicated for use with the sound filmstrip except that an audible tone was added at those points where the filmstrip should be turned on to the next frame.

The sound track for the captioned filmstrip with narration was recorded. The words in the caption were read with clear enunciation and a period of about four seconds was allowed between captions. Since the war dance section was not printed a minor media difference was created. In the sound filmstrip the students hear the chant but in the captioned filmstrip they are told that the Maoris chanted a war dance and made frightening faces.

Preparation of Testing Instruments

Seventy questions were designed for facts and concepts in the cognitive area rather than the effective area of behavior. The cognitive areas of knowledge as

outlined by Bloom (3) were used as a guide when making the test. The division was:

1. Specifics.
2. Terminology.
3. Specific facts.
4. Conventions.
5. Trends and sequences.
6. Principles and generalizations.
7. Theories and structures.

Care was taken to see that the questions did not cue each other and that none of the four possible choices in each question was obviously correct or incorrect. The questions were related to the words and picture in each frame of the filmstrip.

Sixty questions were chosen from the original seventy and used in a pilot study on 135 children comparable to those in the experimental group.

Selection of the Experimental Population

The superintendents of schools in the East Whittier, Montebello, and Whittier City districts in Los Angeles County, California, gave permission for the study to be carried out in their schools. Twenty sixth-grade classrooms were selected from ten different areas in order to have students of varying socio-economic status.

Upon the recommendation of the superintendent, the schools made the cumulative records available so that intelligence quotient, age, sex, and father's occupation could be recorded for each student. This information was kept confidential and students' names and the names of the schools were omitted from the tables tabulating the results. The students involved had all been given the California Test for Mental Maturity within a period of nine months prior to the study.

The socio-economic status of the students was determined by using a scale reported by Warner (22:140). Warner based his rating on the occupational status of

the father. The scale was divided into seven categories. In some isolated cases approximations had to be made since the students were not certain of their father's occupation.

When matching the students into four groups, IQ, age, sex, and socio-economic status were considered. The matching was done so that there were five classes in each group and the total number of boys and girls in each group was approximately the same. In only one instance was it necessary to have two classes from the one school in the same group.

The investigator noted that there were extremes in IQ and checked with the classroom teachers regarding any children who had extreme reading difficulty or language difficulty. The scores of these few children were not included in the statistical analysis.

The Pilot Study

Procedures for presenting the four media were checked in the pilot study and the reliability of the test was found to be .85, using the Kuder-Richardson formula 20. An item analysis, for difficulty and discrimination enabled two equivalent forms of thirty questions each to be constructed by pairing questions for subject matter, difficulty and discrimination.

Administration of the Experiment

A survey of the viewing conditions was made so that all students could see and hear the presentations with comparable ease. In each school the presentation was made in the room customarily used for projection. Equipment was checked and the same pieces used throughout the experiment.

The experiment was begun after the usual schoolday preliminaries were completed. The teacher introduced the investigator as having come from the district office to conduct an experiment. The investigator played a tape so that each class had the same introduction. The students heard that, just as manufacturers

test their products to make refinements, so do the makers of films and filmstrips. They then heard how they could help in the study; that the material was about the Maoris of New Zealand, and their way of life before and after the arrival of the white settlers. The students were then told that they would have a test to see how much they already knew and that, after seeing the presentation, they would have a different test from the results of which the investigator could tell how well they had been taught by the materials. To help prevent unnecessary anxiety, the students were told that the results would not appear on their final reports, but that they would be made known to them by their teacher.

The pre-test was distributed so that students sitting beside each other had different forms of the test. Reading books were left accessible by the students so that they would not be idle after completing the test. No time limit was placed on the students and the instructions printed on the front page of the test required them to answer all the questions and mark only one choice in each question. After the completion of the pre-test--about fifteen minutes--the room was darkened for projection or the students were taken to the projection room.

The presentation completed, the students were given the alternate form for the post-test. The testing and presentation were all completed within an undivided hour. The teacher was asked not to tell the students that there would be a retention-test and was requested not to encourage discussion regarding the content.

Three weeks later the retention-test was administered. For this test both forms were stapled together to make a sixty-question test. Students sitting beside each other began work on a different form. This was considered to be an added precaution against copying.

Assembling the Data

The tests were hand scored since separate answer sheets were not used. The total scores from the three tests, showing which form they had been scored on, were entered on a ledger sheet together with the IQ, age, socio-economic status,

and sex of the students. The gains from the pre-test to the post-test and from the pre-test to the halved retention-test score were also recorded on the form.

Statistical Analysis

The data were statistically treated to show test reliability, population matching and whether there were any significant differences in learning from the media. The statistical treatment of the test scores was focussed on the mean gain between the pre-test and the post-test and then the mean gain between the pre-test and retention-test. A method was sought which would allow all of the mean gains within each series of tests to be tested for significance. The analysis of variance (7:315) and the corresponding test for significance based upon the F distribution permitted this to be done.

If the F test shows there is a significant variance among a group containing more than two means, then a further test is needed to find whether there is a significant difference between any one mean and any other mean.

It was decided to use the Tukey test (7:331) if a significant variance was found. The Tukey test for significant gap between adjacent rank ordered means shows whether any one mean is significantly superior or inferior to the others.

The Tukey test is applied by taking t at some defined level of significance, for example, at the 5 per cent level, for the degree of freedom available and then solving for

$$\text{Significant gap} = (t.05)\ (\sqrt{2})\ (S\bar{x})$$

Where $S\bar{x}$ is defined as by the formula

$$S\bar{x} = \frac{S}{\sqrt{n}}$$

and t.05 is the tabled value of t at the .05 level for the degrees of freedom associated with the mean square within groups.

The t test of individual means was not applied to test findings after the analysis of variance showed a significant F ratio, since it involves the hypothesis that the samples have been drawn at random from a common population (10:264). When making a t test of two extreme means, however, the two sample means have not been selected at random for comparison.

CHAPTER III

PRINCIPAL FINDINGS

The four media were presented and tests given to equivalent groups of students under comparable conditions. The findings on the reliability of the testing instruments, matching of the population, and gains in knowledge from the media presentations follow.

Test Reliability

The reliability of each test was calculated by the internal consistency method. The Kuder-Richardson formula 20 was used for the pre-test and the Kuder-Richardson 21 was used on the post-test and retention-test. Since the number of items in the post-test was thirty, whereas the number of items used in the other tests was sixty, the Spearman Brown formula (10:492) was used to adjust the estimated reliability for purposes of comparison. The pre-test reliability was .85, the post-test reliability was .72, and the retention-test reliability was .75.

The Population

The four groups were matched on the basis of age, IQ, and socio-economic status. As may be seen in Table 1, there were no statistically significant differences between the groups using these criteria. The four groups may be considered as equivalent. The population was regrouped according to sex for age and IQ differences. The boys' mean age was one month greater than the girls' and this was significant at the .01 level. A one point difference between the mean IQ of the boys and girls was not significant. The mean IQ of 110 may be slightly higher than that of the general population.

TABLE 1

MEANS AND STANDARD DEVIATIONS OF THE MATCHED GROUPS FOR AGE, INTELLIGENCE QUOTIENT, SOCIO-ECONOMIC STATUS, AND SEX

Variable	Group	N	Mean	S.D.
Age	C	138	137.34	5.39
	CN	144	138.19	4.39
	F	138	138.29	4.99
	SF	138	137.92	5.07
	t = 1.52		df 274	NS
IQ	C	138	111.62	14.04
	CN	144	110.18	15.48
	F	138	109.98	15.78
	SF	138	109.91	15.48
	t = 0.96		df 280	NS
Socio-Economic Status	C	138	3.59	1.57
	CN	144	3.54	1.62
	F	138	3.52	1.57
	SF	138	3.59	1.63
	t = 0.34		df 274	NS
Age	Boys	294	138.49	5.30
	Girls	264	137.33	4.52
	t = 2.75		df 556	p<.01
IQ	Boys	294	110.89	16.18
	Girls	264	109.89	14.07
	t = 0.77		df 556	NS

The population was also redivided into three IQ levels. The students were divided into the top third, middle third, and lower third according to their intelligence quotient. The means were 127, 109, and 94 respectively.

Test Results

The students did learn by each of the four methods. After establishing an average of eleven plus on the pre-test, the students averaged twenty-three plus on

the post-test. These results were achieved on a thirty-item test made up of four choice questions.

Immediate mean gains

Comparison of the four methods.--The mean for each of the twenty-four sub-groups and the average mean for each of the methods may be seen in Table 2. The difference between the four method gains of 12.25, 12.28, 11.23, and 11.76 was statistically significant at the .05 level of confidence in the analysis of variance. The Tukey test for significant gap, when applied to the rank ordered means, showed that no one method was significantly superior or inferior despite the fact that there was significant variance among the four means.

TABLE 2

MEAN GAINS BETWEEN PRE-TEST AND POST-TEST FOR THE FOUR METHODS AT THE THREE INTELLIGENCE QUOTIENT LEVELS BY SEX

		Method			
Sex	Level	C	CN	F	SF
Boys	Upper	13.04	13.04	12.87	11.72
	Middle	13.04	13.60	12.22	11.52
	Lower	11.80	11.76	11.17	11.00
Girls	Upper	13.05	14.26	11.44	12.81
	Middle	11.00	10.74	10.69	12.48
	Lower	11.33	10.13	9.00	11.24
Means by Methods		12.25	12.28	11.23	11.76

Average Mean Gain = 11.88

Comparison of male and female.--The difference between the boys' mean gain of 12.24 and the girls' of 11.49 was significant at the .01 level. This may have been due to the slightly older age of the boys or the subject matter may have been more appealing to boys.

Comparison of intelligence levels.--The mean gain of the upper third was 12.77, of the middle third 11.94, and of the lower third 10.94. The analysis of variance showed the difference was significant at the .05 level. In each case the brighter students learned more.

Interaction between sex and methods.--In Table 3 a breakdown of the mean gains of boys and girls according to the methods shows that the highest mean gain of 12.80 was scored by the boys who saw the captioned filmstrip with narration and the lowest of 10.37 was gained by the girls who saw the filmograph. The trend was for the girls to achieve smaller mean gains than the boys, except in the case of the sound filmstrip where a reversal took place. After the effects of the variables of sex and methods were removed, in accord with a method noted by Guilford (10:276), the pattern observed in the raw score mean gains is more clearly shown. The variance among the boys' scores was smaller than the variance among the girls' scores. The results of the analysis of variance indicated, at the .05 level, that some of the variance in learning scores is dependent on the interaction of methods and sex.

There was no significant difference in the interaction between levels and methods or the interaction between sex and levels.

TABLE 3

MEAN GAINS BETWEEN PRE-TEST AND POST-TEST AND ADJUSTED MEAN GAINS WITH VARIABLES REMOVED FOR THE FOUR METHODS BY SEX

Sex	Methods				Average Mean of each Sex
	C	CN	F	SF	
			Mean Gains		
Boys	12.63	12.80	12.09	11.41	12.24
Girls	11.79	11.71	10.37	12.18	11.49
			Adjusted Mean Gains		
Boys	11.91	12.04	12.35	11.11	11.85
Girls	11.82	11.69	11.38	12.62	11.85
Average Mean of Methods	11.85	11.85	11.85	11.85	11.85[a]

[a]Allowance being made for rounding errors.

The results of the analysis of variance for the immediate gain are shown in Table 4.

TABLE 4

ANALYSIS OF VARIANCE ON THE MEAN GAIN BETWEEN PRE-TEST AND POST-TEST

Source	Sum of Squares	df[a]	Mean Square	F	P
Total	1890.43	557	--	--	--
Within	6111.45	534	11.44	--	--
Methods	101.23	3	33.74	2.95	.05
Sex	76.64	1	76.64	6.69	.01
IQ Levels	311.67	2	155.84	4.62	.05
Sex and Methods	110.55	3	36.85	3.21	.05
Levels and Methods	39.10	6	6.52	0.57	--
Sex and Levels	67.58	2	33.79	2.95	--

[a]df = degrees of freedom

Note:

The triple interaction was in no case significant.

Retention mean gain

Comparison of the four methods.--The mean gains of the twenty-four subgroups and the average mean for each method are shown in Table 5. The analysis of variance showed that there was no significant difference between the mean gains for each group of 7.83, 8.39, 7.76, and 7.64. Although the subgroups changed to some extent in their rank order, the groups which scored the greatest and least mean gains maintained their respective positions. The difference between the highest and lowest subgroups in the immediate gain was 3.50 points. In the retention gain this difference was extended to 4.52 points.

TABLE 5

MEAN GAINS BETWEEN PRE-TEST AND RETENTION-TEST FOR THE FOUR METHODS AT THE THREE INTELLIGENCE QUOTIENT LEVELS BY SEX

Sex	Level	Method			
		C	CN	F	SF
Boys	Upper	8.80	10.10	9.57	7.48
	Middle	8.54	9.18	9.07	7.64
	Lower	7.28	7.48	6.46	6.84
Girls	Upper	8.59	10.57	7.94	8.86
	Middle	7.00	6.61	7.50	8.52
	Lower	6.45	6.26	6.04	6.67
Means by Methods		7.83	8.39	7.76	7.64

Average Mean Gain = 7.91

Comparison of male and female.--The average mean gain for the boys was 8.21 and for the girls 7.58. The analysis of variance showed this difference to be significant at the .01 level. This is a similar result to the immediate mean gain.

Comparison of intelligence levels.--The mean gain for the three groupings shows the score of the upper third to be 8.99, the middle third 8.03, and the lower third 6.70. The difference is significant at the .01 level.

There were no significant differences among the interactions between sex and methods, levels and methods, or sex and levels.

The results of the analysis of variance on the retention mean gains are shown in Table 6.

TABLE 6

ANALYSIS OF VARIANCE ON THE MEAN GAIN
BETWEEN PRE-TEST AND RETENTION-TEST

Source	Sum of Squares	df[a]	Mean Square	F	P
Total	6707.43	557	--	--	--
Within	5843.10	534	10.94	--	--
Methods	47.22	3	15.74	1.44	--
Sex	54.55	1	54.55	4.69	.01
IQ Levels	492.83	2	246.41	22.52	.01
Sex and Methods	82.87	3	27.62	2.52	--
Levels and Methods	97.26	6	16.21	1.48	--
Sex and Levels	34.13	2	17.07	1.56	--

[a]df = degrees of freedom

Note:

The triple interaction was in no case significant.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Statement of the problem

The purpose of this study, as stated in the first chapter, was to compare the relative effectiveness on factual learning of: (1) a captioned filmstrip, (2) a captioned filmstrip with narration, (3) a sound filmstrip, and (4) a filmograph. The study attempted to verify the hypothesis that the filmograph, being more polished and a more complete package, could teach more effectively.

No studies of the same nature were found in the available literature, but some studies were located which compared films with filmstrips and films with filmographs. The findings generally showed that there was no significant difference between the effectiveness of the media studied.

Method of procedure

From a population of 558 sixth-grade students in Los Angeles County, California, four matched groups of approximately the same size were formed. The students were matched for intelligence quotient, age, sex, and socio-economic status. The matching was done so that there would be five classes in each group.

After the materials had been produced and the tests made, a pilot study was conducted so that any necessary refinements on the tests and procedures could be made.

The experiment was administered so that the students in each class had a pre-test, saw the presentation, and then had a post-test, all within an hour. The experiment took two weeks and each class was given a retention-test after a

three-week period. The data were recorded and from the data statistical evidence of the matching of the groups and reliability of the tests was established. An analysis of variance was conducted and Tukey tests were made on the four methods.

Findings

The statistical evidence showed the groups were sufficiently well-matched and the tests reliable enough to make competent analysis of the results.

Analysis of variance on the mean gain between pre-test and post-test

1. There was a significant difference between the methods, but the Tukey test on the rank ordered means revealed that no one method could be considered significantly superior or inferior.

2. The boys did significantly better than the girls.

3. Students with a higher intelligence quotient did significantly better than those with lower intelligence quotients.

4. The interaction between sex and methods was significant.

Analysis of variance on the mean gain between pre-test and retention-test

1. There was no significant difference between the four methods.

2. The boys were significantly better than the girls.

3. The students with the higher intelligence quotients did significantly better than the students with the lower intelligence quotients.

4. No interactions were significant.

Conclusions

The hypothesis that the filmograph can teach better than the filmstrip is rejected. Matched groups of students can apparently learn equally well from captioned filmstrip, captioned filmstrip with narration, sound filmstrip, and filmograph. This was found to be the case on the immediate post-test and on the retention-test given three weeks later.

It would appear from this study that having such media differences as musical background, panning, pop-on words, and other filmic techniques has no measurable effect on learning. However, it should be remembered that the specific effects used within each medium were not separated for testing purposes. Each of the media was designed to convey the same content using the same pictures and words.

The effects used were those which were considered as being peculiar to each medium and contributing to its general effectiveness. It is possible that some of the effects used within each of the media cancelled out other effects. It is also possible that some students learn more effectively from one medium than from another. It is difficult to conclude how much of the learning achieved in this study may have been influenced by any one, or a combination, of several factors such as motivation from the subject matter content, the presence of a stranger in the classroom, the interest of a different activity, and the importance and competitiveness in taking part in an experiment. Perhaps when these conditions exist, any presentation made in a clear and competent manner will produce results showing no significant superiority or inferiority of any one medium.

The findings of this study tend to support previous research regarding media effectiveness. It is important to realize that any of the media, when used efficiently, will improve the learning situation. Efficient use depends entirely on the classroom teacher. The teacher must decide which medium is likely to most effectively meet the needs of the particular situation.

In a study such as this, consideration must be given to the limitations of subject matter, the type of questions asked, and the size and nature of the sample, when drawing conclusions. This study was made with sixth-grade children and different results may have been obtained with children in lower or higher grades. The conclusions mentioned apply only to the students presented with the materials under the conditions of this study. Repetition, using different subject matter or different grade levels, might result in different conclusions.

Recommendations

If quantity and quality are to be continually sought in the teaching-learning situation, it is important for specific research to continue to seek ways of improving instruction and instructional techniques. This study covers a limited area, but even so, it opens avenues for more studies to follow.

Further investigation is required in such areas as the types of sound tracks, length of materials, and the use of materials for optimum effect. Perhaps the most pressing need is the development of new types of testing devices, as a paper and pencil test is possibly limiting after a visual and auditory presentation.

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